U.S. ARMY

Center for Army Analysis

ANALYSIS OF MOVEMENT REQUIREMENTS FOR UNIT EQUIPMENT

SEPTEMBER 2000

CENTER FOR ARMY ANALYSIS
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

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The Army G3
ATTN: DAMO-SSW
400 Army Pentagon
Washington, DC 20310-0400

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A

13. ABSTRACT *(Maximum 200 Words)*

This project focused on developing a methodology to conduct a deployment analysis at the line item number (LIN) level. Analysis could be done for future projects looking at the type of equipment required for deployment. The project used the results of the Total Army Analysis - 2007 (TAA-07) base case as a test bed for the prototype developed in this project. The process is very flexible and uses Access and Excel for its execution and output display.

14. SUBJECT TERMS

Line item number (LIN), Total Army Analysis - 2007, standard requirement code (SRC), tactical assembly area (TAA), movement requirements, deployment profile, unit equipment, combat support (CS), combat service support (CSS)

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NSN 7540-01-280-5500
Standard Form 298

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ANALYSIS OF MOVEMENT REQUIREMENTS FOR UNIT EQUIPMENT

SUMMARY

THE PROJECT PURPOSE was to create an ability to analyze current deployment analyses at the line item number (LIN) level of detail in support of the Division Redesign.

THE PROJECT SPONSOR was the US Army G3.

THE PROJECT OBJECTIVES were to:

(1) Develop an automated process to analyze deployment results at the LIN level of detail.

(2) Create flexibility in the automated process for use in a variety of deployment analyses.

THE SCOPE OF THE PROJECT

(1) Use the Total Army Analysis - 2007 (TAA-07) base case as a data set in the development of the process.

(2) Develop the process to expand a force list at the standard requirement code (SRC) level vice unit level.

THE BASIC APPROACH used in this report was to develop a series of queries in Access to easily expand the deployment results.

THE PRINCIPAL FINDINGS of the AMRUE Report are**:**

(1) For TAA-07, trucks accounted for the largest short ton (STON) deployment requirements for both theaters.

(2) The process is flexible and can be used for a variety of future projects.

THE PROJECT EFFORT was directed by Mr. Giles D. Mills III, Mobilization and Deployment Division, Center for Army Analysis (CAA).

COMMENTS AND QUESTIONS may be sent to the Director, Center for Army Analysis, ATTN: CSCA-MD, 6001 Goethals Road, Suite 102, Fort Belvoir, VA 22060-5230.

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CONTENTS Page

FIGURES

1 INTRODUCTION

1.1 Background

- Combat vehicle structure has been the focus of the Chief of Staff of the Army (CSA) redesign initiative, and little analysis has been done on the other vehicle types
- Current deployment analyses give little visibility on pieces of equipment, instead focusing on unit type (SRC)

Figure 1. Background

Prior deployment analyses were done at the unit level of resolution; however, there was a need to have the ability to look at the deployment requirements at the line item number (LIN) level. With this capability, an analyst could gain insight to the types of equipment that are part of the requirement. The process should have the capability to aggregate similar types of equipment--for example, trucks. A quick turnaround time was also recognized as a requirement. General Shinseki, Army Chief of Staff, has a vision that the Army should have brigades designed to be more deployable.

1.2 Purpose

- To give an expansion to deployment results, the Director requested a count/STON/sq ft rollup for certain types of equipment (i.e., trucks, generators, etc.)
- This expansion would help in the current analysis of the Division Redesign Initiative

Figure 2. Purpose

A process should be developed to provide an expansion to the current deployment process. The process would be used to gain information for the analysis of redesigning the Army brigade structure.

1.3 Objective

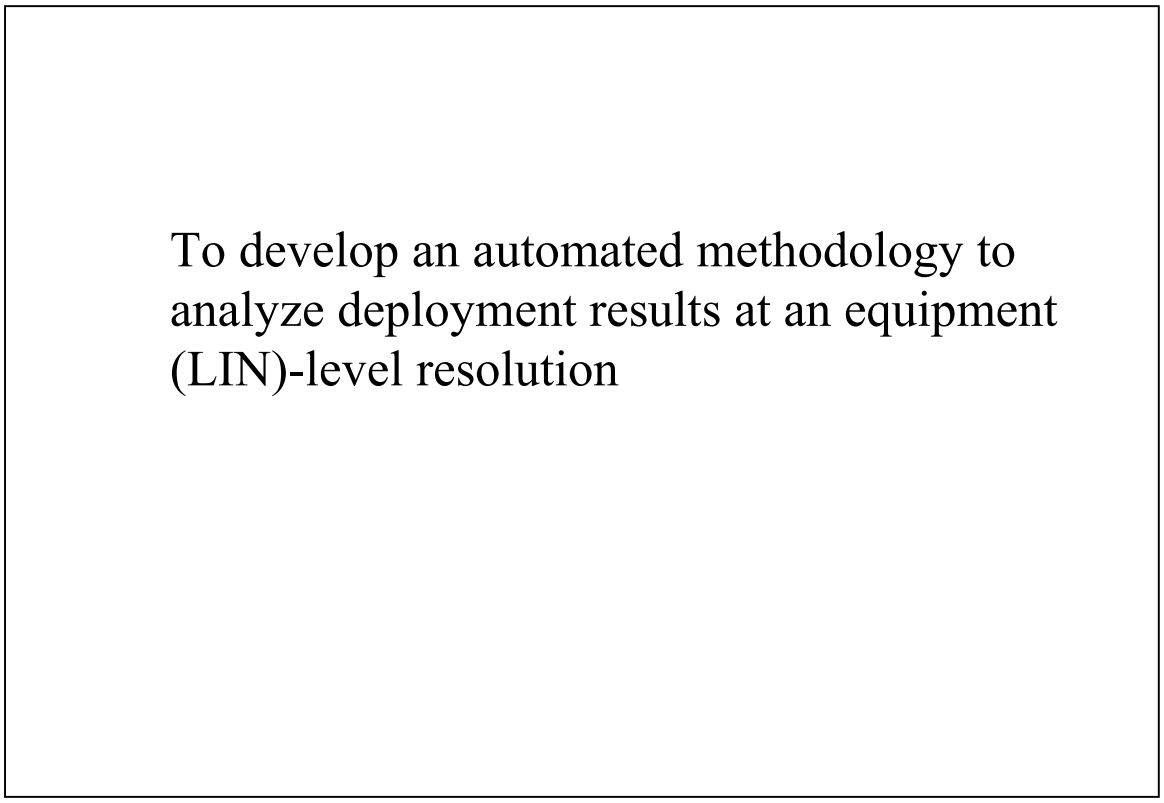

Figure 3. Objective

A process should be developed to provide a quick turnaround capability for future analyses. The process should not modify any of the existing models used in the current deployment process, but should be a separate expansion to be executed when required. The process should use software that is easily obtained. Flexibility should be built into the process for use over a wide range of analysis.

1.4 Scope

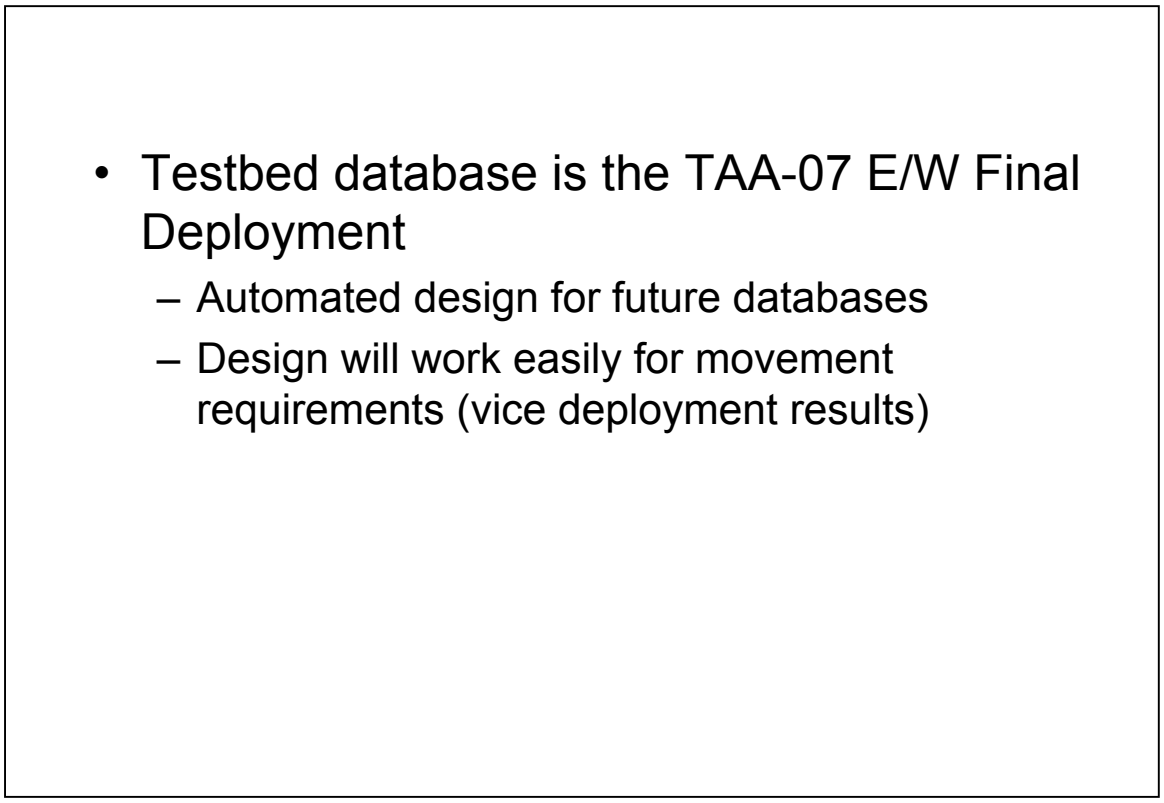

Figure 4. Scope

The Total Army Analysis - 2007 (TAA-07) base case was used while the process was being developed; however, the process is flexible enough to use in other analyses. Output from the AMRUE process using the TAA-07 base case was used to show the capability of the process.

1.5 Data Requirements

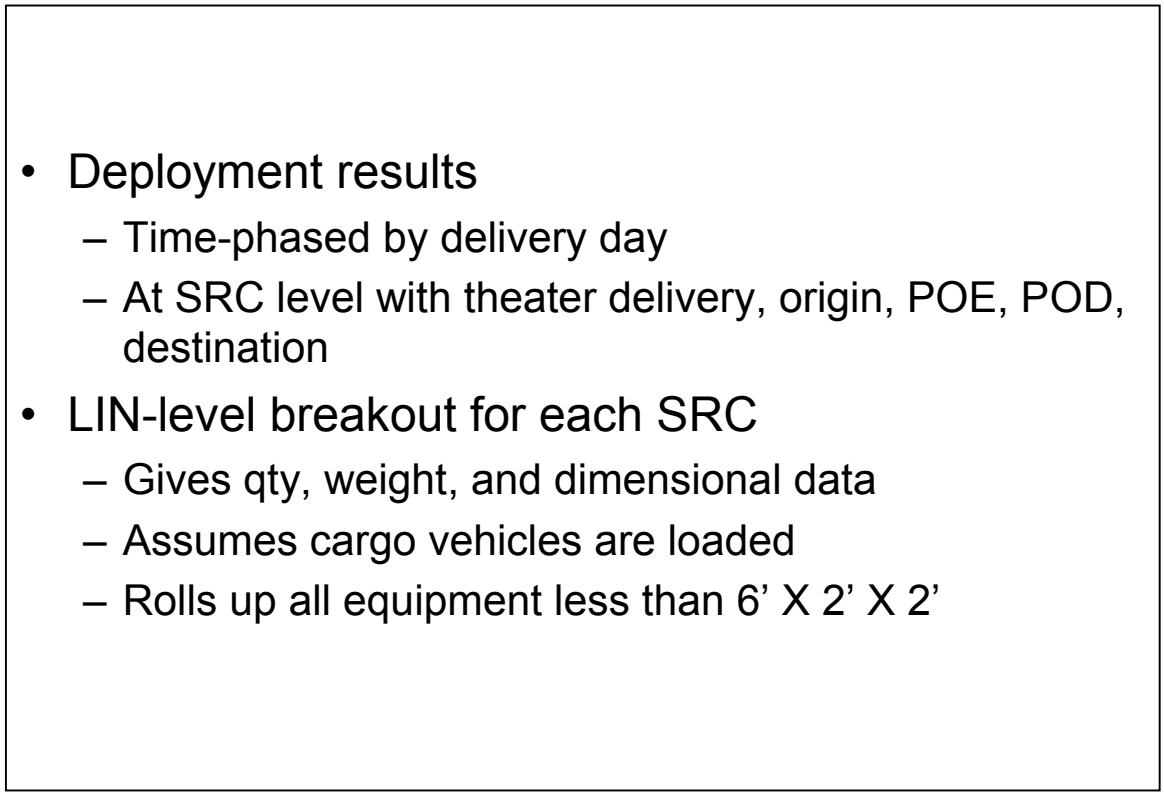

Figure 5. Data Requirements

One input to this process is the standard deployment results which are converted from a text file to an Access database file. This file contains the list of units that are deployment requirements as well as other deployment information, such as required delivery date, origin, and destination. A second file is the LIN listing for each standard requirement code (SRC). The file contains a listing of the LINs and quantity associated with each SRC and the dimension and weight for each LIN. The caveat for this file is that no piece of equipment that is less than 6 feet x 2 feet x 2 feet is listed as a separate entry.

- **Unit type file**: defines the unit (SRC) with the following criteria:
  - **Combat**: all units organic to a division, armored cavalry regiment (ACR), separate bde, corps assets
  - **CS**: units in the following branches, not in the combat category (Aviation, Chem, Engineer, Field Artillery, Signal, Military Police, Special Forces, PSYOPS, Military Intelligence, Air Defense
  - **CSS**: units in the following branches, not in the combat category (Medical, Ordnance, Quartermaster, Pers Serv Sup, Military History, Judge Advocate, Civil Affairs, Maintenance, Public Affairs, Headquarters, Transportation

Figure 6. Data Requirements (cont)

The process has many user-defined areas. Users have the ability to define the types of units they are interested in aggregating. This definition can go all the way down to the SRC level. The example that was used for developing the process is shown in Figure 6 above.

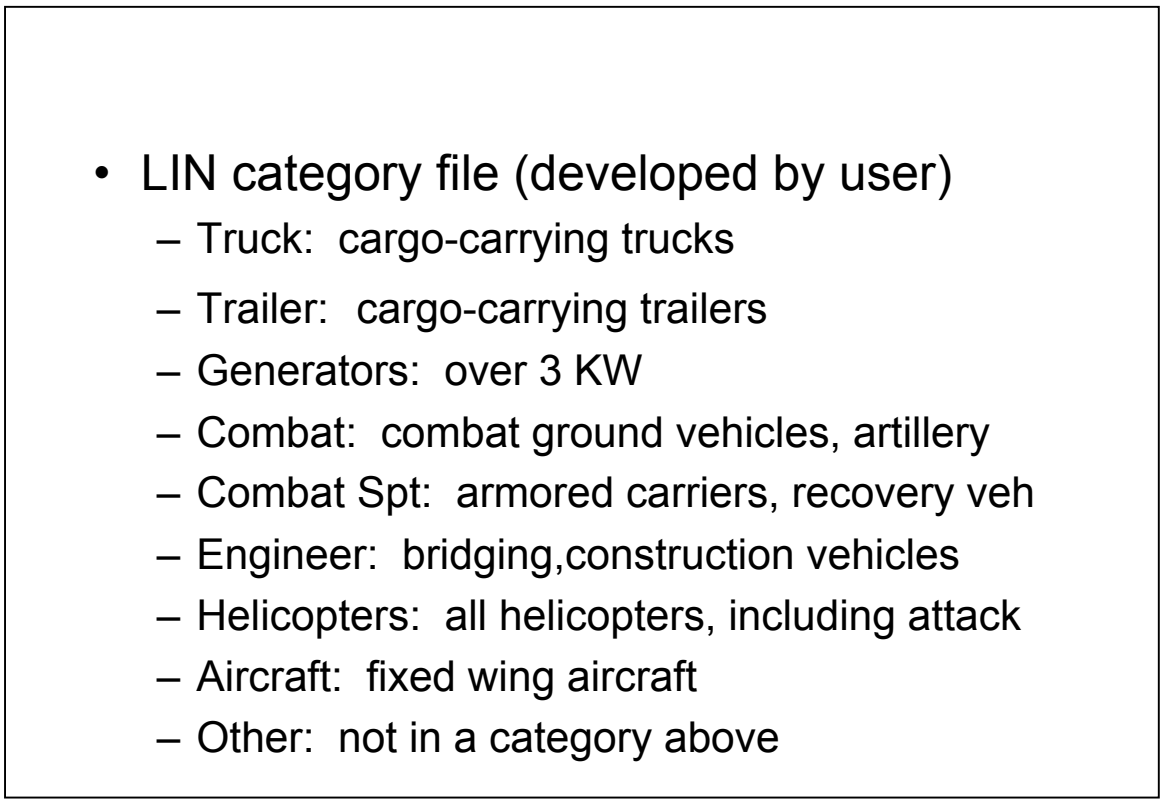

Figure 7. Data Requirements (cont)

Users also have the ability to define the types of LINs they are interested in aggregating. This definition can go all the way down to the LIN level. The example that was used for developing the process is shown in Figure 7 above.

1.6 Methodology

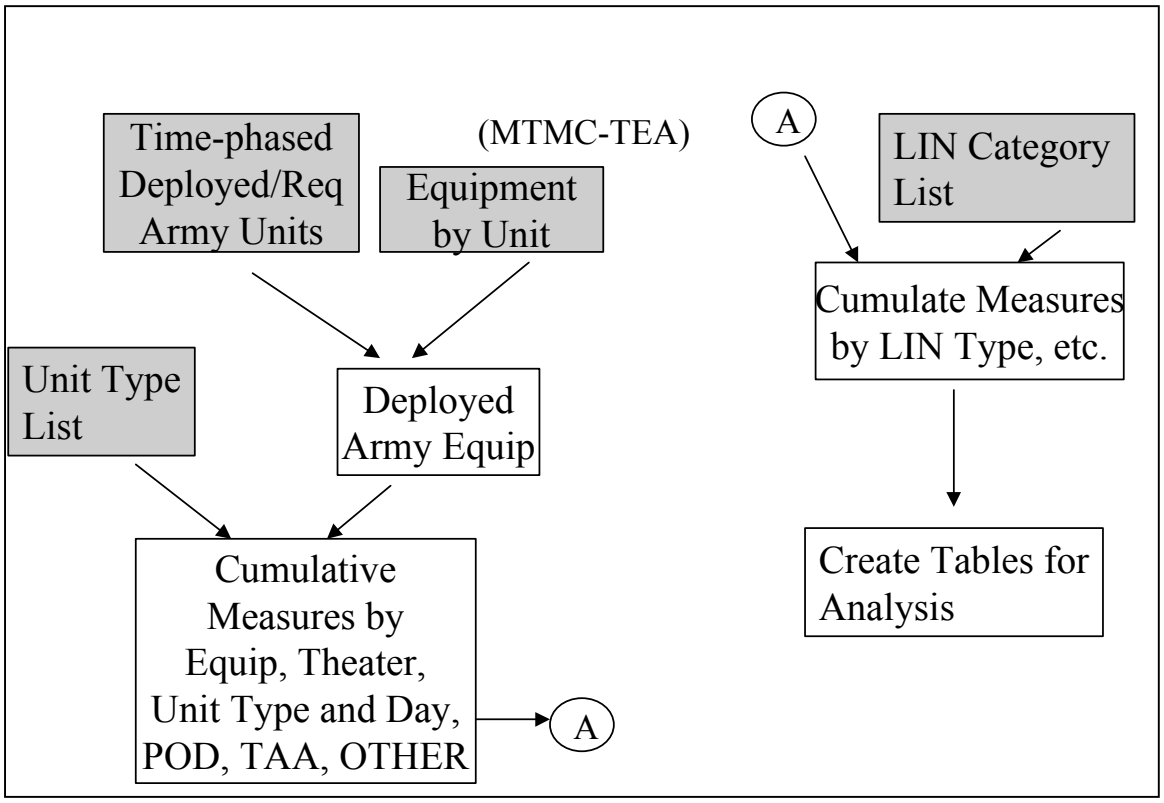

Figure 8. Methodology

The flowchart in Figure 8 depicts the process that was developed at the highest view. The shaded boxes are input files to the process. The time-phased deployment requirements come from the Global Deployment Analysis System (GDAS) Model, and the equipment by unit comes from Military Traffic Management Command Transportation Engineering Agency (MTMC-TEA). The unit type list and the LIN category list are the user-defined files mentioned earlier. The whole process is done with Access using a series of queries. First, the time-phased deployment requirements and the equipment by unit are combined to produce a listing of the requirement at the LIN level. From here the aggregation begins; the user defines using the unit type list and the LIN category list to aggregate the requirement at whatever level is necessary for the project.

1.7 Environment

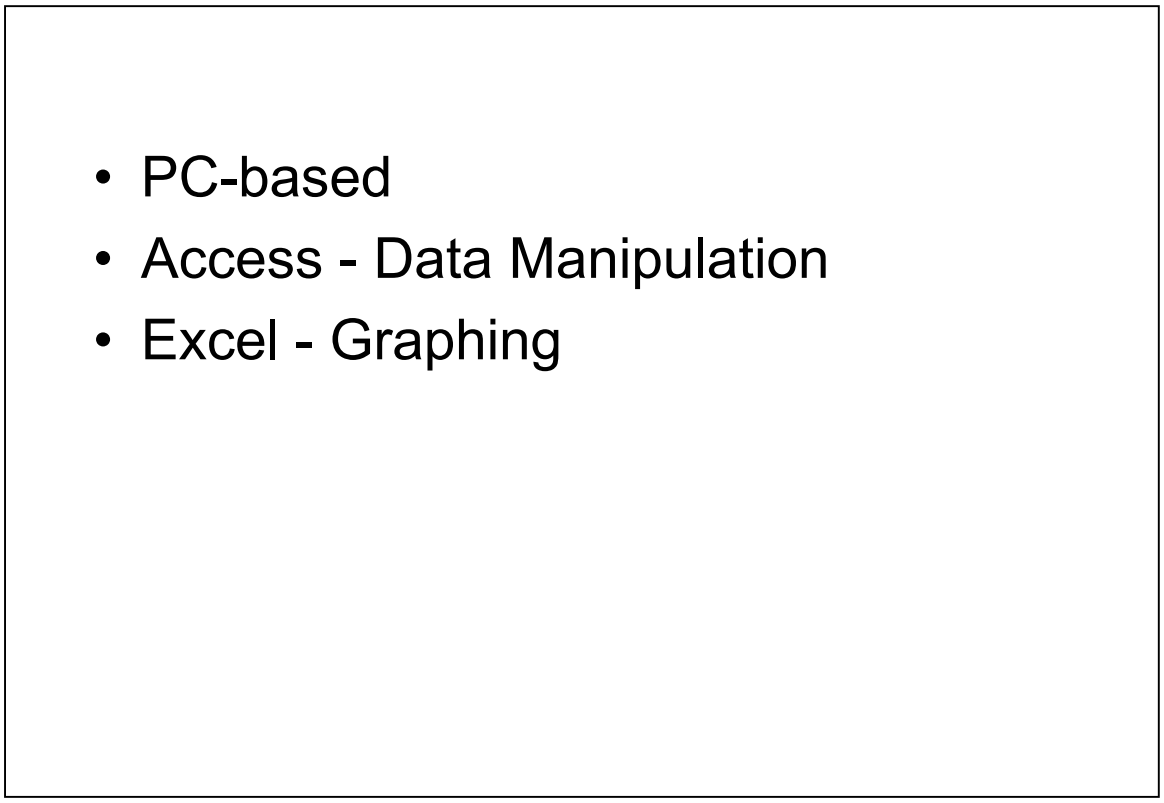

Figure 9. Environment

This process can run on a PC using Access for the data manipulation and using Excel to produce graphs for the output.

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2 ANALYSIS

This chapter discusses some analysis of the TAA-07 base case data that was used to create the process.

2.1 Output Layers

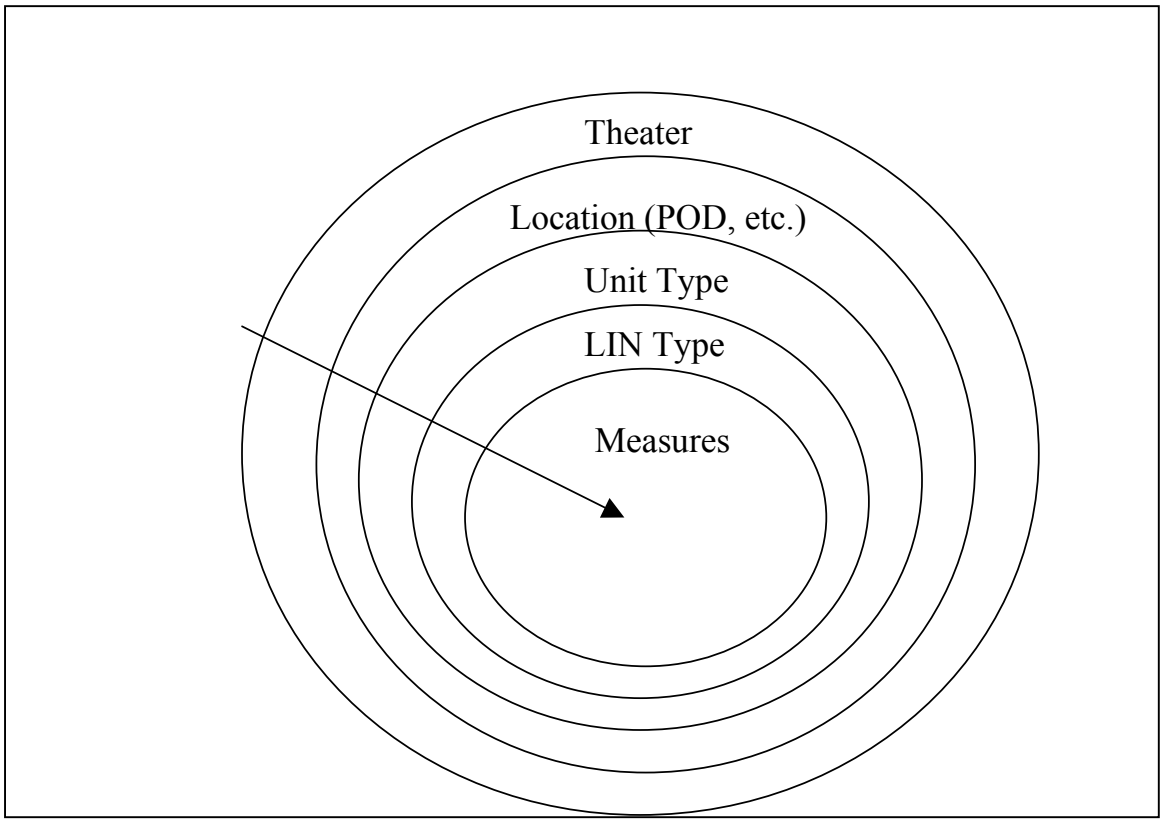


Figure 10. Output Layers

Figure 10 shows the different layers that can be used to aggregate the data. For example, once the user defines the aggregation at the theater level, then he/she defines the aggregation at the location level, etc. The user may also choose at any level not to aggregate.

2.2 Output Data Matrix

Theater	Location	Unit type	Equip type	Measure
SWA	N/A	Combat	Truck	Quantity
NEA		CS	Trailer	STON
		CSS	Combat Veh	Sq ft
			Combat Sup	Cube ft
			Generator	
			Engineer	
			Helicopter	
			Aircraft	
			Other	

OR …..

Figure 11. Output Data Matrix

This is just one example of how a user may choose to aggregate; this is the aggregation scheme that was chosen to test the process.

2.3 Output Data Matrix - Illustrative

Theater	Location	Unit type	Equip type	Measure
NEA	Kimhae	Hvy Div	Truck	Quantity
	Pusan	Lt Div	Cbt Enabler	STON
	TAA1	Reserve Cbt	Medical	Sq ft
	TAA2	Field Arty	Log Enabler	Cube ft
	Ft Hood	CS/CSS	Generator	
			HET	
			MLRS	

Bottom Line: Very Flexible

Figure 12. Output Data Matrix - Illustrative

Figure 12 shows another aggregation scheme. TAA1 and TAA2 would be specific tactical assembly areas (TAA) located in a theater. Users may create their own unit types and equipment types, such as the logistic enablers. The user would have to specify the LINs that would be defined as logistic enablers.

2.4 Output

TYPE	STON	QTY
AIRCRAFT	354	44
COMBAT VEH	155,178	5,285
COMBAT SUP	63,772	1,964
ENGINEER	124,040	5,705
GENERATOR	14,928	8,916
HELICOPTER	10,454	1,309
OTHER	607,048	174,756
TRAILER	247,610	37,044
TRUCK	567,433	43,855
TOTAL	1,790,817	

Figure 13. SWA STON and Quantities (C+250)

From the TAA-07 base case (Southwest Asia (SWA) portion), this is a summary of deployment requirements using the LIN types created for the prototype. OTHER includes all pieces of equipment not listed in the other categories. Trucks make up the greatest deployment requirement to SWA for all the named categories. To reduce the deployment requirement, one of the areas of concentration would be to review the truck requirement.

TYPE	STON	QTY
AIRCRAFT	354	44
COMBAT VEH	110,009	4,001
COMBAT SUP	39,557	1,266
ENGINEER	88,205	4,437
GENERATOR	10,225	6,400
HELICOPTER	6,701	978
OTHER	442,376	141,852
TRAILER	127,588	20,598
TRUCK	383,287	29,152
TOTAL	1,208,302	

Figure 14. NEA STON and Quantities (C+250)

Trucks also make up the greatest deployment requirement to Northeast Asia (NEA) for all the named categories. To reduce the deployment requirement, one of the areas of concentration would be to review the truck requirement.

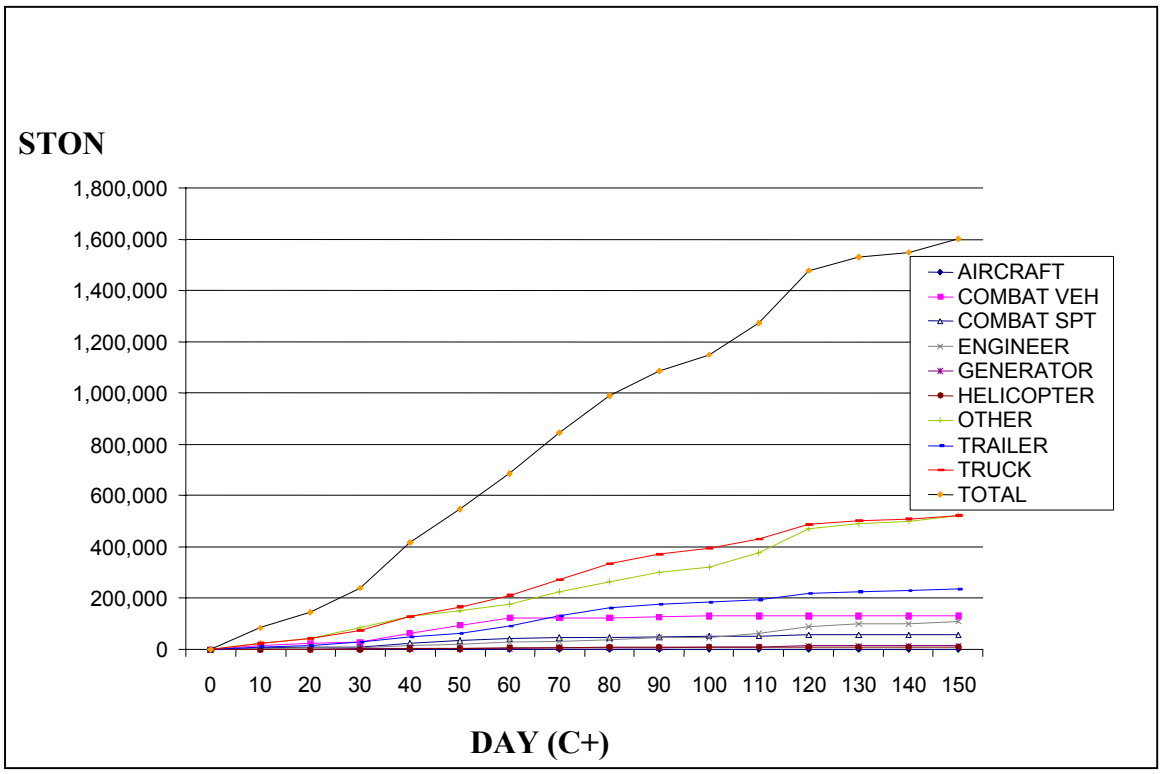


Figure 15. SWA Equipment Deployment Profile - STON

One of the other features of this process is the ability to analyze timing of the requirements. Figure 15 shows the LIN category STON buildup over time. Included in the figure is the total deployment requirement to give a relative percentage for each LIN category. This figure shows another way to graphically portray the greater truck deployment requirement compared to all other named categories.

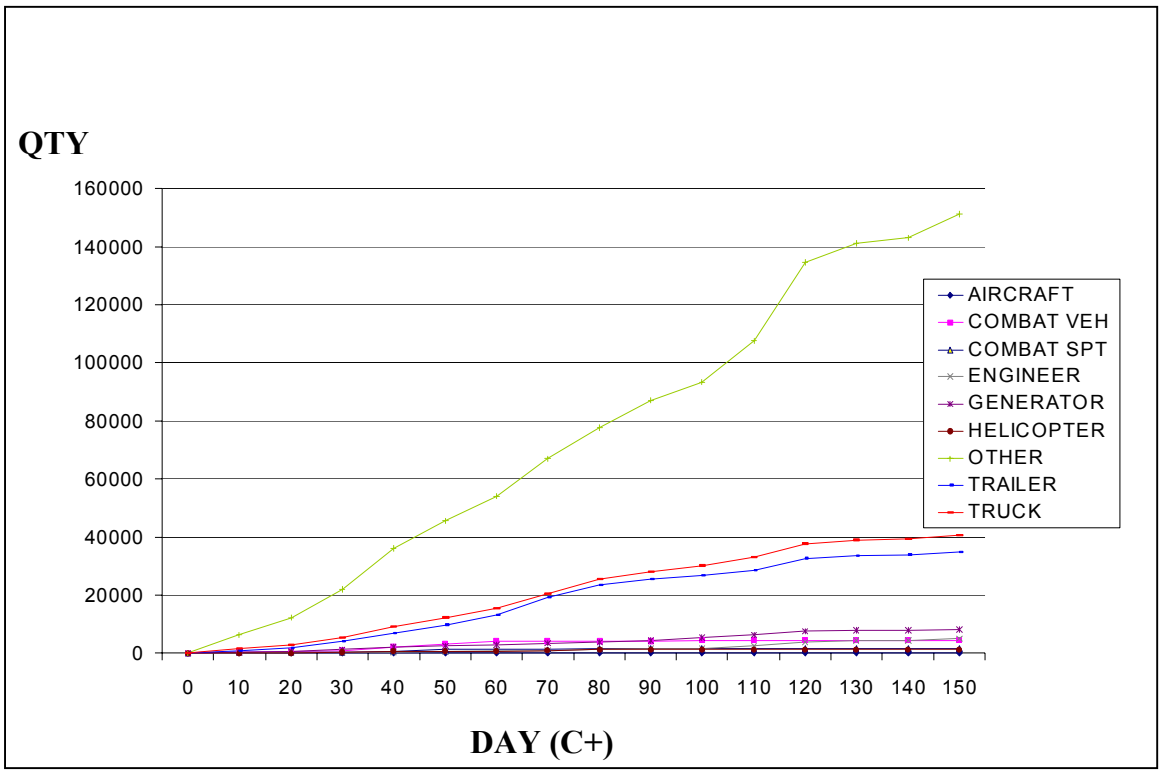


Figure 16. SWA Equipment Deployment Profile - Quantity

Figures 16 through 18 show the LIN category quantity buildup over time. These figures show another way to graphically portray the greater truck deployment requirement compared to all other named categories.

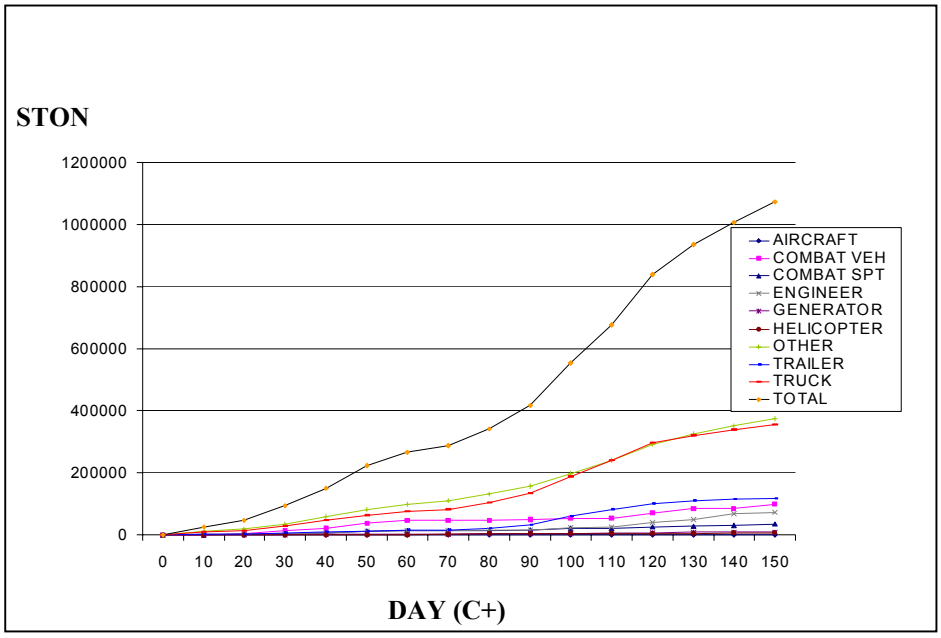


Figure 17. NEA Equipment Deployment Profile - STON

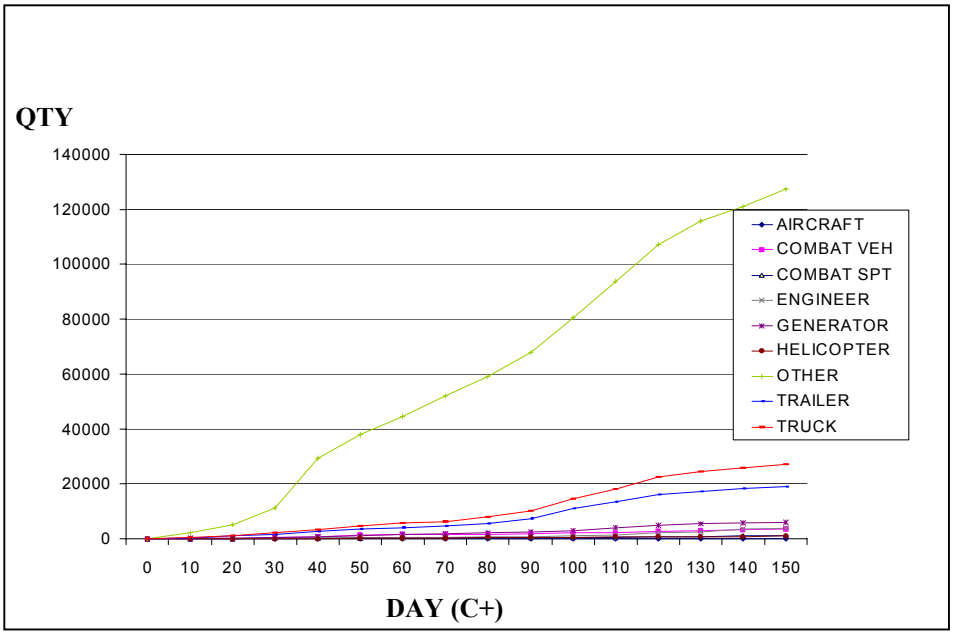


Figure 18. NEA Equipment Deployment Profile - Quantity

TYPE	STON (k)
CBT	513
CS	477
CSS	801
TOTAL	1791

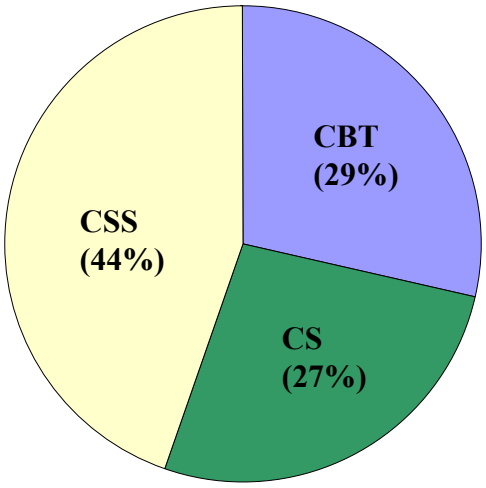


Figure 19. SWA UE Unit Type Breakout (STON)

The breakdown shown in Figure 19 reflects the percentage of the deployment requirement generated by each of the unit types in SWA. As can be seen, combat service support (CSS) units generate the largest percentage of the deployment requirement.

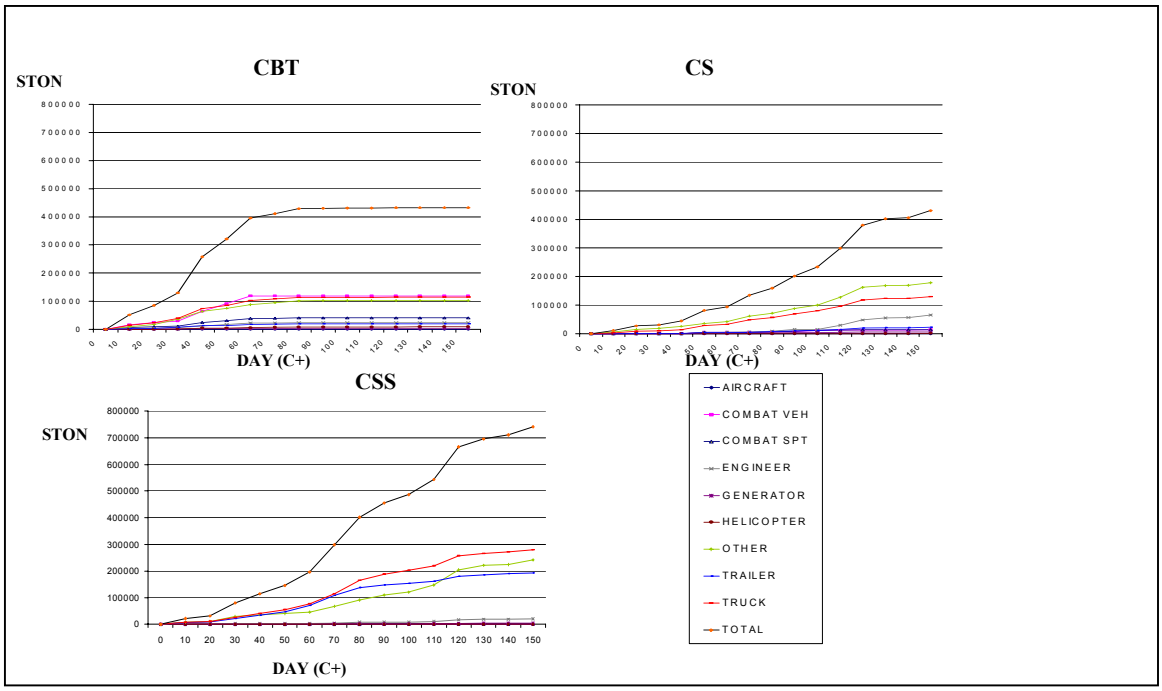


Figure 20. SWA Deployment Profile by Unit Type

The graphs in Figure 20 provide a time-phased breakdown of the type LIN STON requirements by unit type for SWA.

TYPE	STON (k)
CBT	367
CS	366
CSS	475
TOTAL	1208

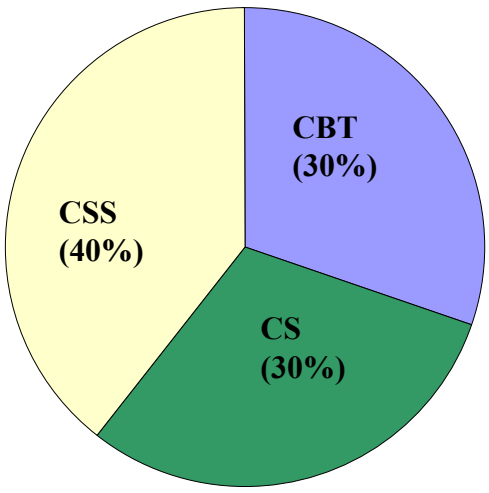


Figure 21. NEA UE Unit Type Breakout

This breakdown reflects the percentage of the deployment requirement generated by each of the unit types in NEA. As can be seen, CSS units generate the largest percentage of the deployment requirement.

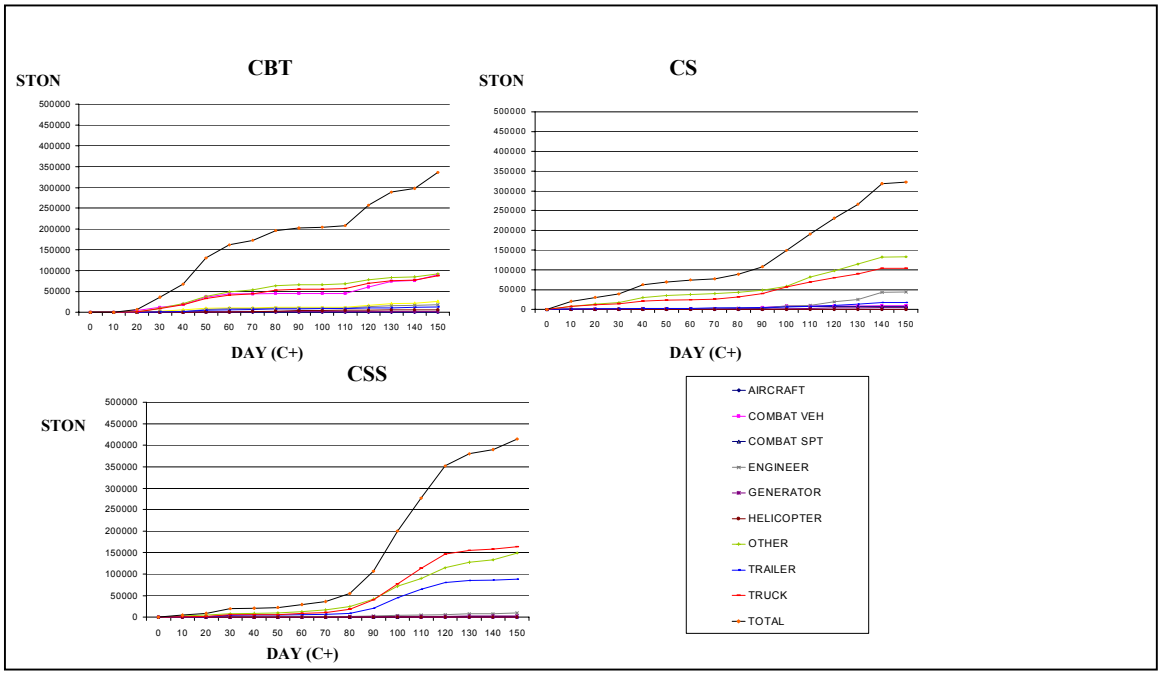
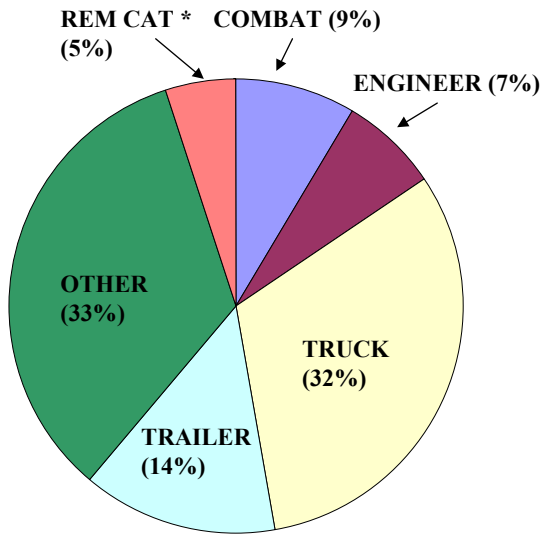


Figure 22. NEA Deployment Profile by Unit Type

The graphs in Figure 22 provide a time-phased breakdown of the type LIN STON requirements by unit type for NEA.

TYPE	STON (k)
COMBAT VEH	155
ENGINEER	124
TRUCK	567
TRAILER	248
OTHER	607
REM CAT *	90
TOTAL	1791

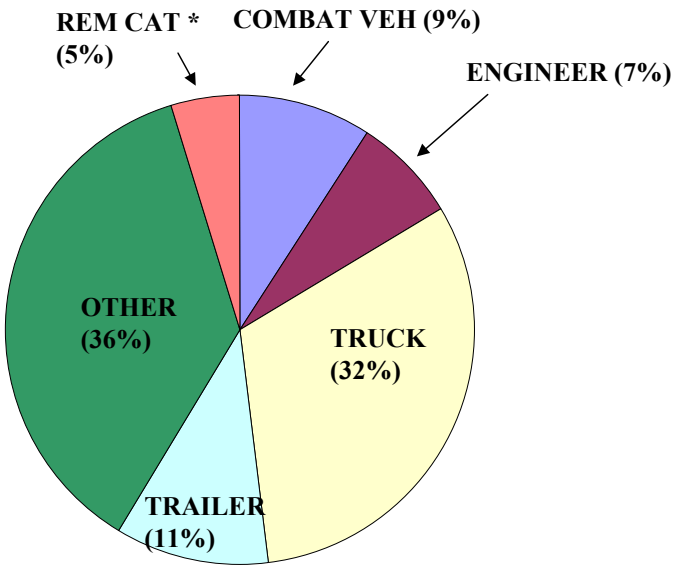


* REM CAT includes AIRCRAFT, CBT SPT, AND HELICOPTERS

Figure 23. SWA Army UE STON by Equipment Category

Figure 23 shows the breakdown of the deployment requirement by LIN category for SWA. As can be seen, the truck STON requirements are the greatest of the named categories.

TYPE	STON (k)
COMBAT VEH	110
ENGINEER	88
TRUCK	383
TRAILER	128
OTHER	442
REMCAT *	57
TOTAL	1208



* REM CAT includes AIRCRAFT, CBT SPT, AND HELICOPTERS

Figure 24. NEA Army UE STON by Equipment Category

Figure 24 shows the breakdown of the deployment requirement by LIN category. As you can see, the truck STON requirements are the greatest of the named categories for NEA as well.

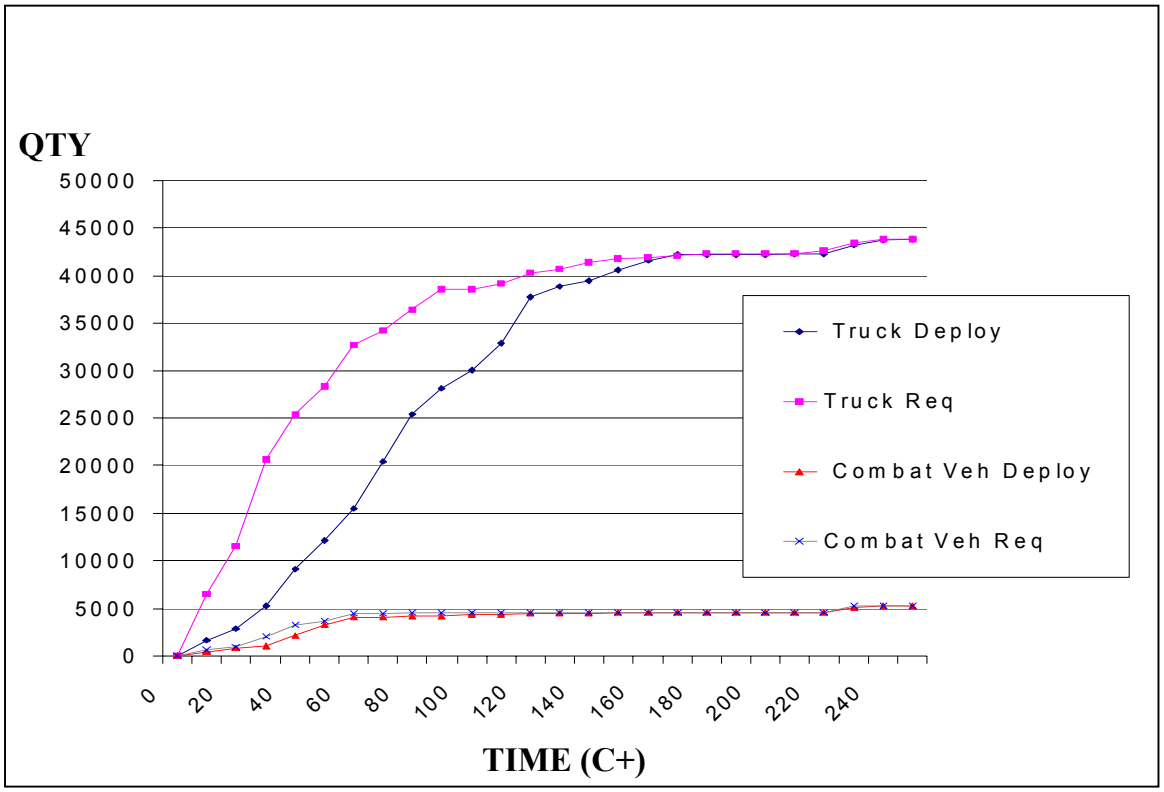


Figure 25. SWA Truck and Combat Vehicle Profiles - Quantity

Figure 26 shows the lag in the deployment of trucks by quantity compared to the time they are required in SWA. By contrast, combat vehicles are deployed when they are needed.

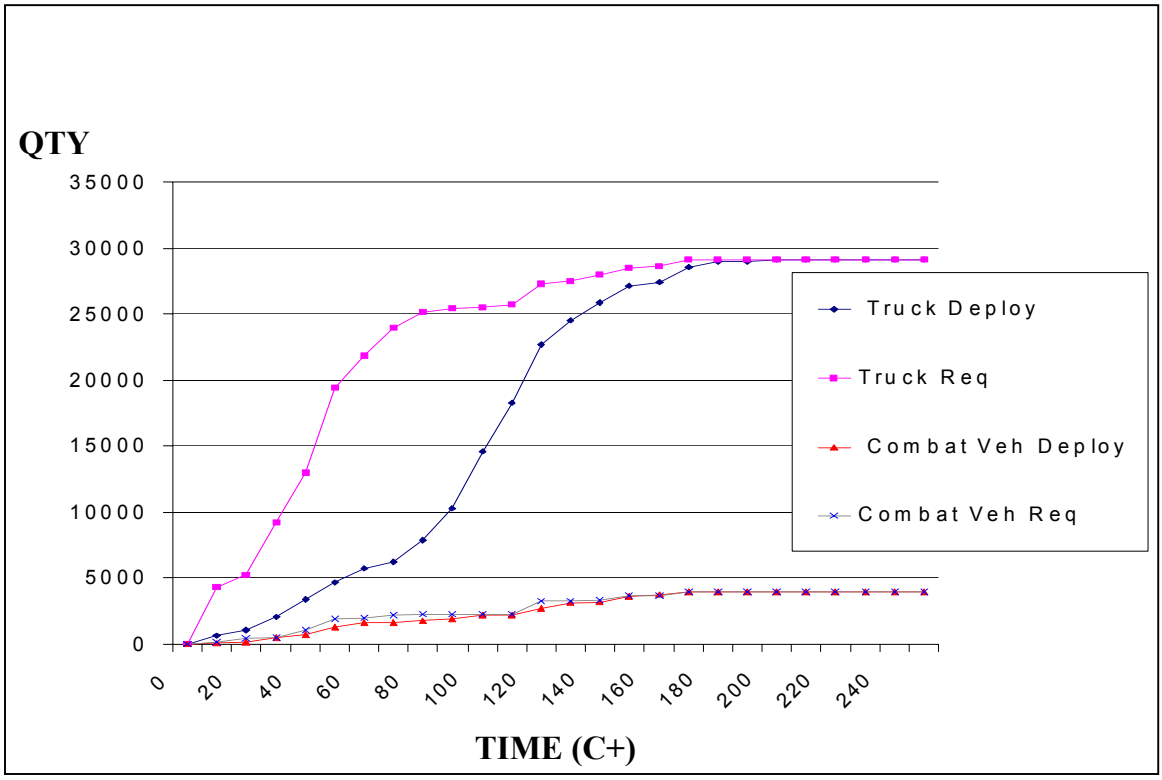


Figure 26. NEA Truck and Combat Vehicle Profiles - Quantity

Figure 28 shows the lag in the deployment of trucks by quantity compared to the time they are required. By contrast, the combat vehicles are deployed when they are needed.

3 CONCLUSION

3.1 Summary

- Trucks account for 32% of STON of Army unit equipment required to be moved, larger than any other LIN group
- Process is automated for use in future projects involving deployment analysis; can be used for movement requirements
- Process is very flexible

Figure 27. Summary

The process was created for future deployment analysis or movement requirements analysis. The process is very flexible due to amount of control the user has in the process. Depending on the user's requirements, the user-defined input files will allow the process to create the data that is needed.

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APPENDIX A PROJECT CONTRIBUTORS

1. PROJECT TEAM

a. Project Director

Mr. Giles D Mills III, Mobilization and Deployment Division

b. Team Members

Ms. Pinal Patel
Ms. Keisha Dumas

2. PRODUCT REVIEW

Dr. Ralph E. Johnson, Quality Assurance
Ms. Nancy M. Lawrence, Publications Center
Ms. Tina Davis, Publications Center

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APPENDIX B REQUEST FOR ANALYTICAL SUPPORT

PART 1

Performing Division: MD ***Account Number:*** **2000029**

Tasking: Verbal ***Mode (Contract-Yes/No):*** No

Acronym: **AMRUE-07**

Title: Analysis of Movement Requirements for Unit Equipment

Start Date: 04-Nov-99 ***Estimated Completion Date:*** 31-Mar-00

Requestor/Sponsor (i.e., DCSOPS): DCSOPS ***Sponsor Division:*** SSW

Resource Estimates: ***a. Estimated PSM:*** 2 ***b. Estimated Funds:*** $0.00

c. Models to be **ADAPT**

Description/Abstract:

The objective of this project is to characterize the movement requirements for both major theater wars by type of unit equipment (e.g., truck, trailer, combat vehicle, helicopter, engineer equipment, etc.). The project will examine the required force from TAA-07 and provide a data base to support future analyses.

Study Director/POC Signature: *Original Signed* ***Phone#:*** 703-806-5447

Study Director/POC: **Mr. Giles Mills III**

If this Request is for an External Project expected to consume 6 PSM or more, Part 2 Information is Not Required. See Chap 3 of the Project Directors' Guide for preparation of a Formal Project Directive.

Background:

PART 1

When deploying to a major theater war, much of the focus is on the movement of combat systems (e.g., tanks, artillery, helicopters, etc.) However, the Army deploys significant numbers of noncombat systems to the theater. This project will categorize the deployment of unit equipment, providing visibility to what is required for each theater.

PART 2

Scope:

Using the force structure requirements from the Total Army Analysis, determine in 10-day increments the numbers of different types of vehicles that the Army deploys to the major theater war--East and West.

Issues:

Identify suitable classifications to group various types of vehicles.
Determine numbers of vehicles in units based on approved modified tables of organization and equipment.
Determine the flow of units into theater based on the Total Army Analysis deployment analysis.

Milestones: Conduct IARB by the end of February. Deliver completed analysis to the sponsor on 31 March 2000.

Signatures ***Division Chief Signature:*** *Original Signed and Dated* ***Date:***

Division Chief Concurrence: Mr. Franklin Mckie

Sponsor Signature: *Original Signed and Dated* ***Date:***

Sponsor Concurrence (COL/DA Div Chief/GO/SES) COL Jerry Brown

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